

**Errata to the
2010-2011 Alternative and Renewable Fuel and Vehicle Technology
Staff Draft Investment Plan**

Due to an increase of \$8 million in the availability of Alternative and Renewable Fuel and Vehicle Technology Program funds, the Staff Draft Investment Plan total funding allocation has been increased from \$100 million to \$108 million. An additional \$4 million has been allocated to advanced medium and heavy duty on-road demonstration vehicles, an additional \$1 million to light and medium duty propane vehicles and \$3 million to Innovative Technologies and Advanced Fuels . The attached pages have been revised accordingly (pages 20, 25, 68, and 82).

Electric drive medium- and heavy-duty trucks, buses, and non-road vehicles can saturate market niches earlier than electric drive passenger vehicles at a much lower level of production (3,000 to 5,000 vehicles per year). With these production volumes, the vehicles battery costs will be reduced significantly. Additionally, with the higher fuel savings of these vehicles they will achieve cost competitiveness with diesel vehicles sooner than in the light-duty market.

The ARB in coordination with the Energy Commission has decided to use their AB 118 funds for the deployment of on-road medium- and heavy-duty diesel HEVs. The Energy Commission's funds will be used to demonstrate advancements in medium- and heavy-duty BEV and PHEV vehicles as well as hybrid and hydraulic truck applications using alternative fueled vehicles. The Energy Commission funded the demonstration of medium-duty PHEV utility vehicles, shuttles, service trucks, and delivery vehicles through ARRA. Under the FY 2008-2010 Investment Plan, Program funds will match ARRA funding to provide a demonstration of 123 medium-duty plug-in hybrid electric vehicles, primarily in central and southern California. The Program will provide \$9 million with approximately \$26 million from ARRA and \$26 million in participant match funds.

In addition to the California projects, ARRA funded almost 2,576 HEVs and 100 BEVs for demonstration in the medium- and heavy-duty vehicle classes nationwide. The funding will evaluate technical feasibility and build customer familiarity through a nationwide demonstration.

The ARB has allocated \$29 million for four diesel hybrid and hydraulic hybrid truck deployment projects and for advanced technology demonstrations of diesel alternatives over the FY 2009-2010. Due to a large demand for rebates for these hybrids, the number of applicants may exceed ARB's funding.

Next generation plug-in hybrid and battery electric trucks need continuing proof-of-concept demonstrations to accelerate market introduction. The Energy Commission is providing up to \$9.5 million of FY 2008-2010 Program funds in a current solicitation for projects that will advance the technology and develop the commercialization of BEV, HEV, PHEV, and alternative fueled advancements in medium- and heavy-duty vehicles. In addition the Energy Commission is funding a \$3 million dollar Center of Excellence which will test and demonstrate advanced technology for class 8 trucks, including BEVs, PHEVs and HEV's. It will also provide education and outreach. The number of demonstrations and their geographic location will be determined when the Center is established based on need and resources.

To provide ongoing demonstrations of advancements, the Energy Commission will allocate \$128 million in this investment plan to fund demonstration programs to stimulate the development of pre-commercial advanced technologies. Based on stakeholder information received and the demand shown by ARB and ARRA projects, vehicle demonstrations will aid the industry in providing vehicles that respond to customer needs.

Table 7: Electric Drive Funding Summary

Develop and demonstrate advanced on-road medium- and heavy-duty technology	\$ 12 8 Million
Develop and demonstrate advanced non-road medium- and heavy-duty technology	\$2 Million
Infrastructure and related activities	\$3 Million
Manufacturing facilities and equipment	\$7.5 Million
Total	\$24. 50.5 Million

Hydrogen

Hydrogen fuel cell vehicles (FCVs) are zero-emission vehicles, producing no tailpipe criteria pollutants. Fuel cells generate electricity through an electrochemical process, using hydrogen as the fuel, to power an electric motor which drives the vehicle. When the hydrogen is converted to electricity in a fuel cell, the only by-products are heat and water.

Today, very little hydrogen is produced for use as a vehicle fuel. The vast majority of hydrogen is produced for industrial purposes through the reformation of natural gas. Hydrogen produced from natural gas and used in an FCV can reduce GHG emissions by 56 percent when compared to California's reformed gasoline.¹ The GHG reduction potential for hydrogen in FCVs ranges from 26 to 86 percent, depending largely on the hydrogen production method.² The higher values are possible when hydrogen is produced from biomass feedstocks including waste cellulose and biomethane produced from landfill gas.

the nation, which can already support an expanded vehicle market with funding for light- and medium-duty vehicles.³

¹ Based on Detailed California Modified GREET Pathway for Compressed Gaseous Hydrogen from North American Natural Gas version 2.1. California Air Resources Board <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>. and *Full Fuel Cycle Assessment: Well-to-Wheels Energy Inputs, Emissions, and Water Impacts* Consultant Report. California Energy Commission CEC-600-2007-004-REV.

(Numbers are on Grams/mile basis, i.e., EER values included to represent the full picture). Compressed H2 from on-site grid electrolysis: 26%; Compressed H2 from on-site NG reforming: 56%; Compressed H2 from on-site 70% renewable electrolysis: 63%; Compressed H2 from on-site NG reforming using 33% landfill gas as feedstock: 66%; Compressed H2 from on-site NG reforming using 100% landfill gas as feedstock: 86%. (All values % GHG reduction compared to California reformed gasoline baseline).

¹Ibid.

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Infrastructure for propane vehicle fueling could expand quickly, as existing propane dispensing stations can be used for vehicle fueling through the addition of fuel capacity, a tank pump, and metering equipment. With the addition of this equipment, virtually any propane tank/ station in California can be retrofitted to meet a propane vehicle's needs. This will facilitate the increasing demand for propane as a transportation fuel in the years ahead.

The Energy Commission will not provide funding for propane fueling infrastructure in this investment plan, since sufficient federal incentives are in place to support the infrastructure needs in California. Funding for infrastructure may be considered in the future, as the propane market grows.

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The Energy Commission will allocate \$32 million for light- and medium-duty propane vehicles for the FY 2010-2011 Investment Plan. This funding will be used to fund the conversions of between 130 and 200 vehicles to propane, as well as for the buy-down costs of purchasing new vehicles. This funding will create opportunities for fleets to transition quickly and efficiently to alternative fuel use. Propane is readily available and affordable, and provides both immediate GHG emission benefits and energy independence because all propane used in California is domestically produced. Many fleet owners already consider transitioning to propane as a viable option for their fleets. With the additional incentives provided through this Program, more public and private fleets will make the transition, especially with more vehicle options becoming available in late 2010. Additionally, if renewable propane becomes commercially available, it will provide emission benefits comparable to some of the most effective GHG emission reduction fuels. Providing funding for propane vehicles will ensure that California does not inadvertently preclude the potential market for renewable propane in the future.

Table 19: Propane Funding Summary

Light- and Medium-Duty Vehicles	\$32 Million
Total	\$32 Million

Innovative Technologies and Advanced Fuels

In the previous sections, the Energy Commission has identified high-priority investments related to specific fuels and vehicles as well as analytical and outreach strategies. The legislative statute establishing this program also provides the Energy Commission with authority to make public investments in opportunities not specifically identified in this investment plan,

⁴ http://www.afdc.energy.gov/afdc/fuels/stations_counts.html.

Table 21: Funding Allocation Summary for FY 2010-2011

	Project/Activity	Funding Allocation for FY (2010-2011)
Electric Drive	Develop and demonstrate advanced on-road medium- and heavy-duty technology	\$ 12 8 Million
	Develop and demonstrate advanced non-road medium- and heavy-duty technology	\$2 Million
	Infrastructure and related activities	\$3 Million
	Manufacturing facilities and equipment	\$7.5 Million
	Subtotal	\$240.5 Million
Hydrogen	Fueling Infrastructure	\$14 Million
	Subtotal	\$14 Million
Ethanol	Expansion of E-85 dispensers and retail outlets	\$8.5 Million
	Project feasibility, feedstock and pre-plant development activities for new and retrofit advanced ethanol production technologies	\$10 Million
	Subtotal	\$18.5 Million
Biomass-Based Diesel	Production plants using waste feedstocks	\$5 Million
	Bulk terminal storage and blending facilities	\$5 Million
	Subtotal	\$10 Million
Natural Gas	Medium- and heavy-duty port trucks, school buses and other vehicles	\$12 Million
	Upgrades to natural gas fueling stations	\$2 Million
	New construction or expansion of biomethane production, feasibility studies, and quality testing	\$10 Million
	Subtotal	\$24 Million
Propane	Light- and medium-duty vehicles	\$ 32 Million
	Subtotal	\$32 Million
<u>Innovative Technologies and Advanced Fuels</u>	<u>Innovative Technologies and Advanced Fuels</u>	<u>\$3 Million</u>
	Subtotal	<u>\$3 Million</u>
Market and Program Development	Sustainability studies	\$2.5 Million
	Program marketing and public education and outreach	\$2.5 Million
	Technical assistance and environmental/market/technology analyses	\$6 Million
	Subtotal	\$11 Million
Grand Total		\$1080 Million